Overview of the Kissimmee Basin Modeling and Operations Study

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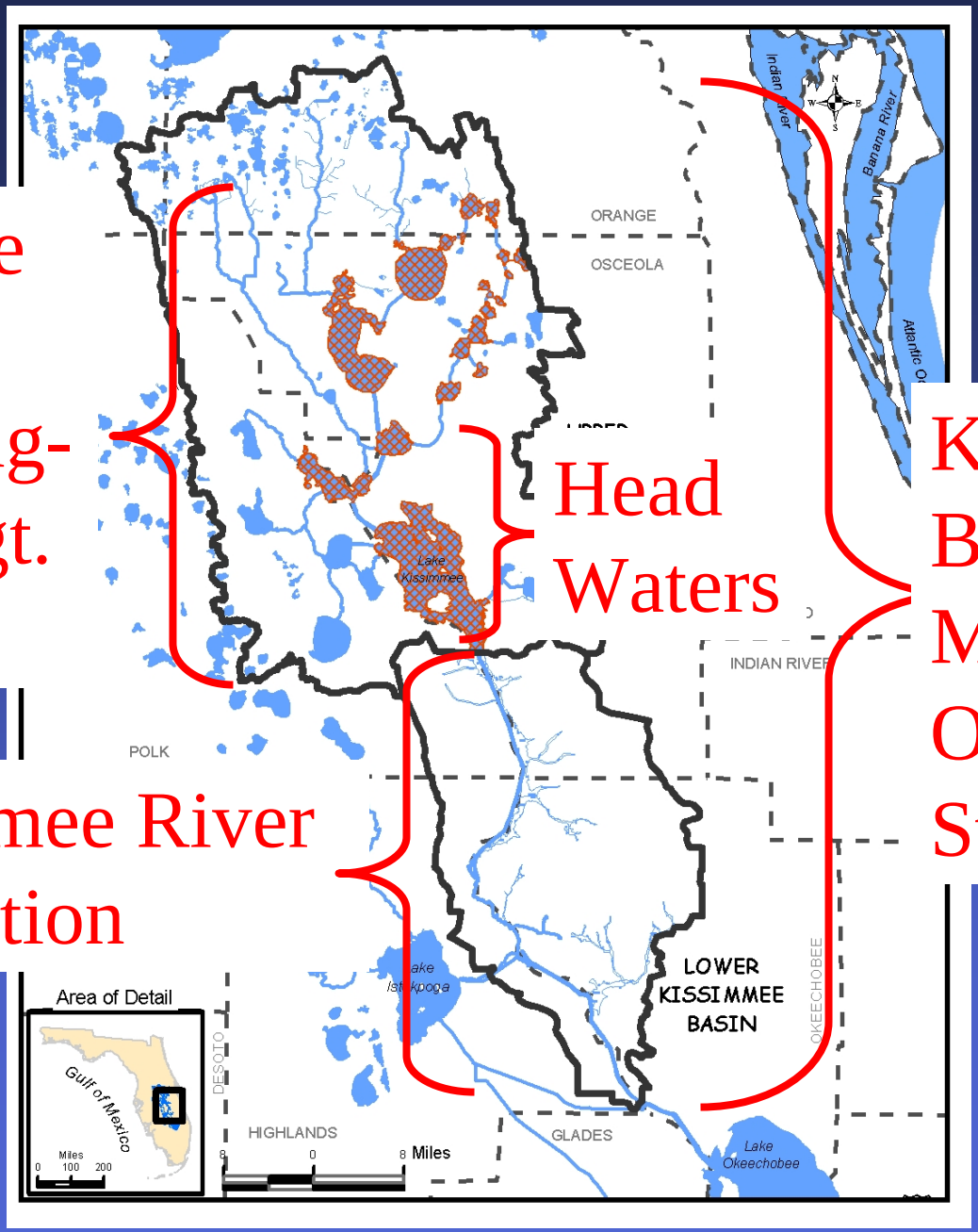
Kissimmee Chain of Lakes Long-Term Mngt. Plan

Kissimmee River Restoration



Head Waters

Kissimmee Basin Modeling & Operations Study

Project	Kissimmee River Restoration	Headwaters Revitalization	Kissimmee Basin Modeling & Operations Study	Long-Term Management Plan
Basis	Ecosystem Restoration	Storage and Wetland Quantity and Quality	Assess Current Operations	Coordinate Management Actions and Operations
Goal	Ecological Integrity	Water for Kissimmee River Restoration	Propose Changes to Operations Criteria	Enhance and Sustain Lake Health
Evaluation	Ecosystem – level Performance Measures	Monitoring	Hydrologic Performance Measures	Hydrologic & Ecologic Performance Measures

Operations Issues in the Kissimmee Basin

Effects of Water Regulation on the Kissimmee Chain of Lakes

- Loss of fluctuating lake water levels
  - Increased in organic matter deposition along the lakeshore
  - Lower dissolved oxygen
  - Shifts in vegetation communities to more problematic species

Kissimmee Upper Basin Development and Water Supply

Kissimmee Chain of Lakes Environmental Requirements

Aquatic Plant Management

- Maintain navigable waters
- Protect water control structures
- Improve aquatic habitat
- Management and treatment requirements:
  - Reduced volume in lakes
  - No/low flow conditions

Flood Protection

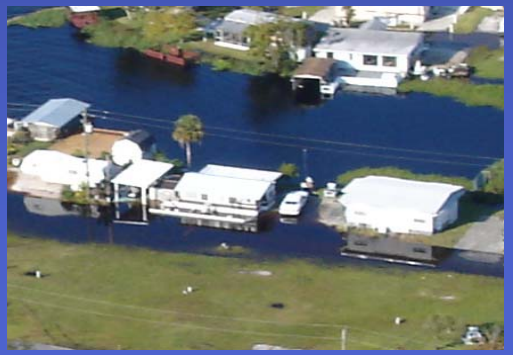
- Protection of lands adjacent to the lakes and along the Kissimmee River from frequent and prolonged flooding
  - Regulate the system to stay within acquired land rights

Water Requirements for Kissimmee River Restoration

Lake Okeechobee

- Kissimmee River is largest tributary
- Total Maximum Daily Load obligation

Management Challenges

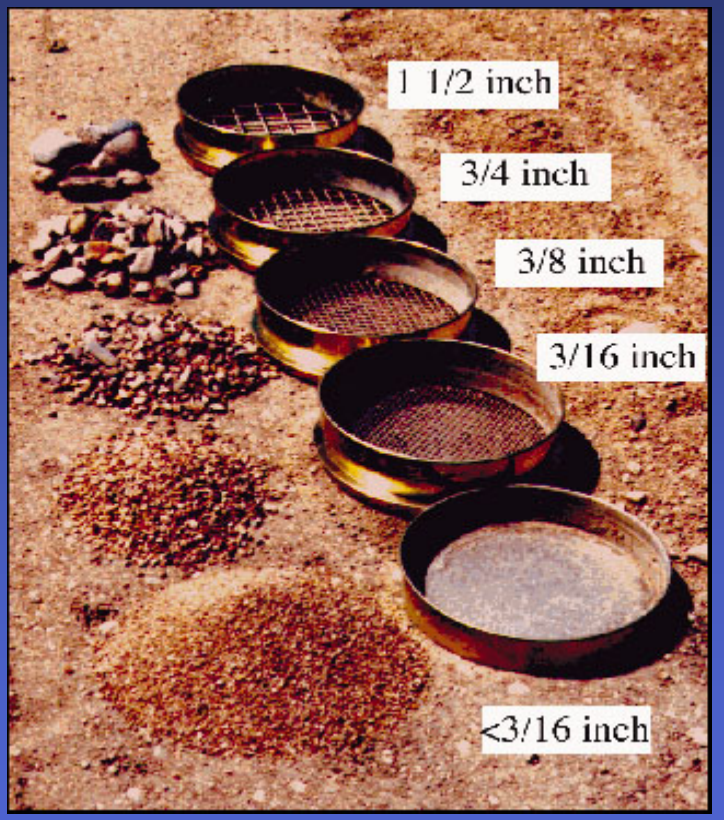


Kissimmee Basin Modeling and Operations Study Goal

- Assess how existing operating criteria for water control structures can be modified to achieve a more acceptable balance between resources in upper and lower Kissimmee basins.

Approach

- Develop a set of three modeling tools that simulate:
  - Structure operations
  - Basin hydrology and hydraulics
  - Land use
  - Climatic conditions
- Develop performance measures to evaluate alternatives



Limitations

No infrastructure changes

No land acquisition

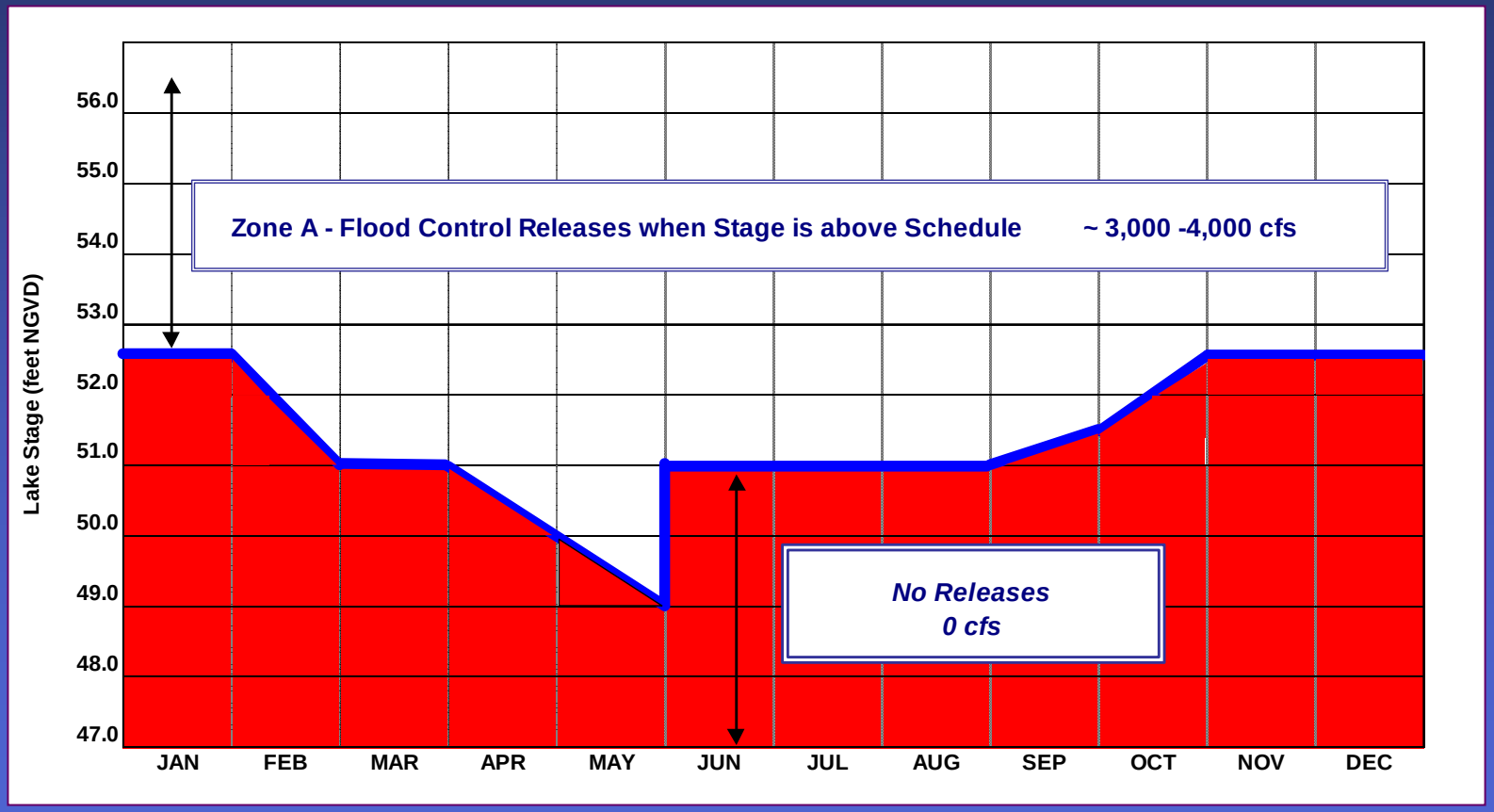
Desired Hydrology

- Lakes
  - Seasonality and Variability in Lake Stages
  - Stage Recession and Ascension Rates
  - Extreme high and extreme low events at a specified frequency, timing, and duration

Desired Hydrology

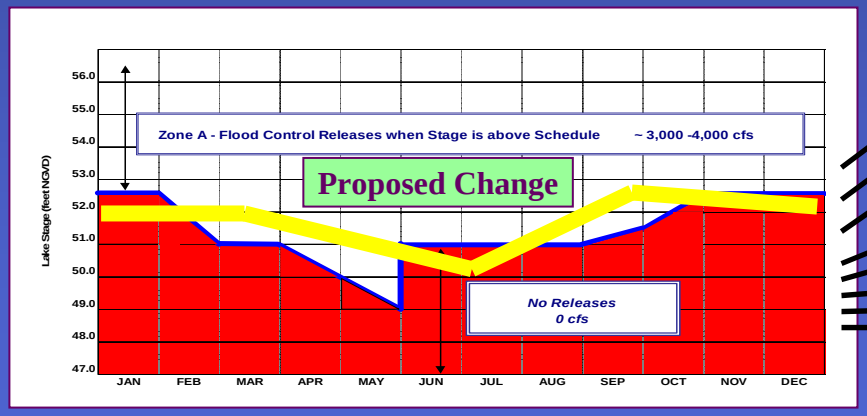
- River
  - Continuity and Seasonality of Flows
  - Stage Recession and Ascension Rates
  - Floodplain Inundation (depth and duration)

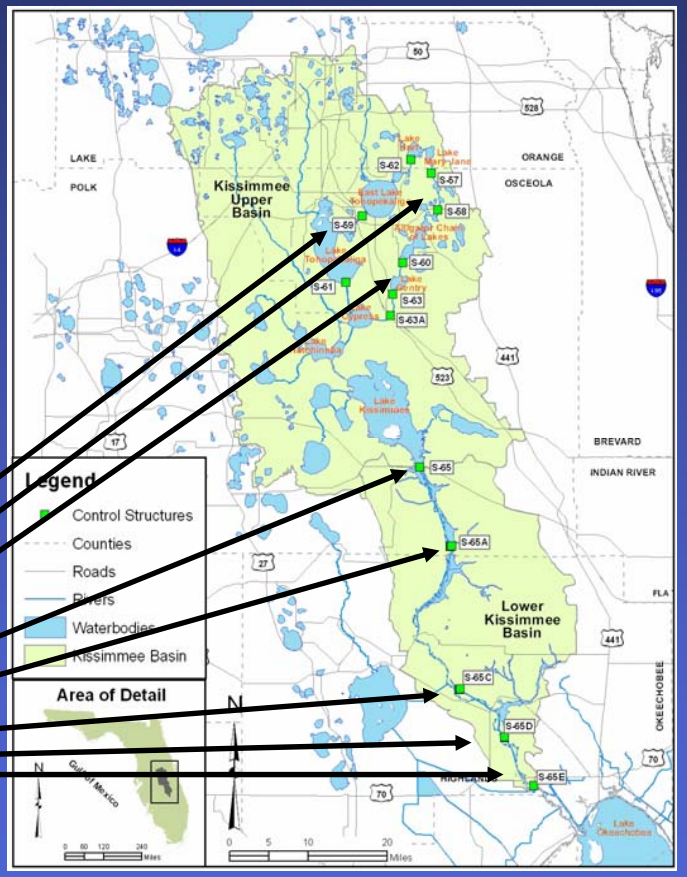
Regulation Schedules



Operations Alternatives

- An alternative is a set of proposed changes for all basin structures





Evaluation Performance Measures

- Define the natural resource requirements for meeting the ecological integrity goal for the river and the ecosystem health goal for the lakes

Evaluation Performance Indicators

- Define flood protection, water supply, aquatic plant management, and other operational requirements for the C&SF project

Constraint Evaluation Performance Indicators

Flood Control

- Probable High Lake Stages
- Kissimmee River Probable Flood Extents

Downstream Ecosystems (Lake Okeechobee)

- Kissimmee River Inflows to Lake Okeechobee

Opportunity Evaluation Performance Indicators

Water Supply

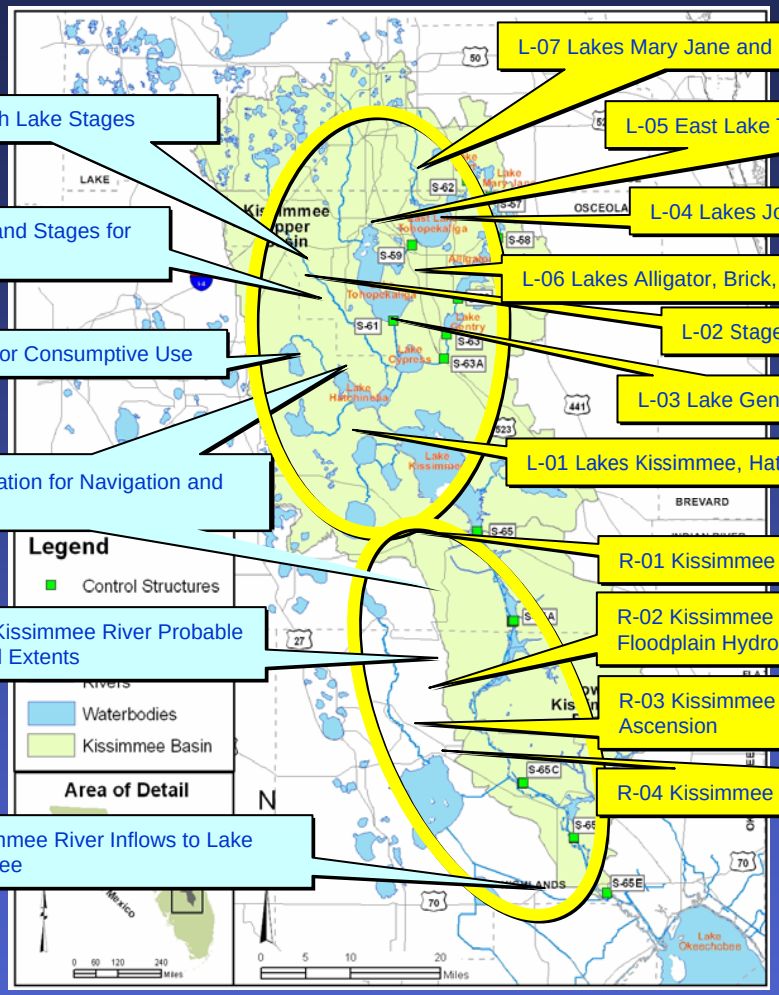
- Water Supply for Consumptive Use

Navigation

- Stage Duration for Navigation and Recreation

Aquatic Plant Management

- Lake Discharges and Stages for Hydrilla Management



I-01Probable High Lake Stages

I-03Lake Discharges and Stages for Hydrilla Management

I-04 Water Supply for Consumptive Use

I-06 Stage Duration for Navigation and Recreation

I-02 Kissimmee River Probable Flood Extents

I-05 Kissimmee River Inflows to Lake Okeechobee

L-07 Lakes Mary Jane and Hart

L-05 East Lake Toho, Fell's Cove, & Lake Ajay

L-04 Lakes Joel, Myrtle, & Preston

L-06 Lakes Alligator, Brick, Lizzie, Coon, Center and Trout

L-02 Stages in Tohopekaliga

L-03 Lake Gentry

L-01 Lakes Kissimmee, Hatchineha, Cypress & Tiger

R-01 Kissimmee River Flow

R-02 Kissimmee River Stage Hydrograph / Floodplain Hydroperiod

R-03 Kissimmee River Stage Recession / Ascension

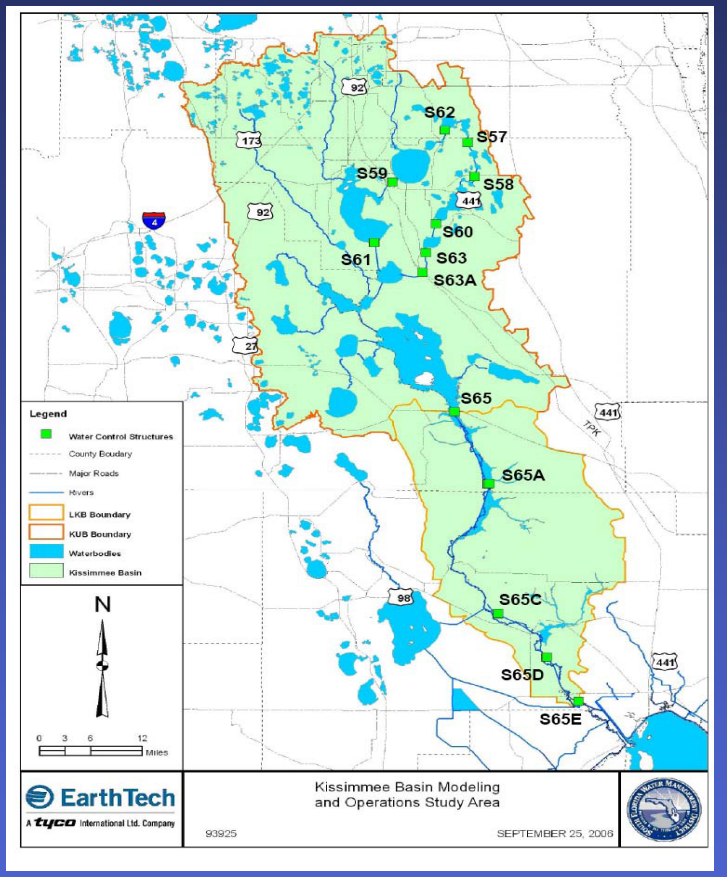
R-04 Kissimmee River Channel Velocity

A suite of **Performance Measures** and **Performance Indicators** were developed to evaluate alternatives

Environmental Impact Statement for Modification of Structure Operating Criteria

- Evaluate alternatives relative to potential beneficial and adverse effects on
  - Flood protection
  - Navigation
  - Water quality
  - Water supply
  - Wetlands and fish and wildlife habitats and values
  - Endangered and threatened species
  - Historical or archaeological resources
  - Public use and recreation

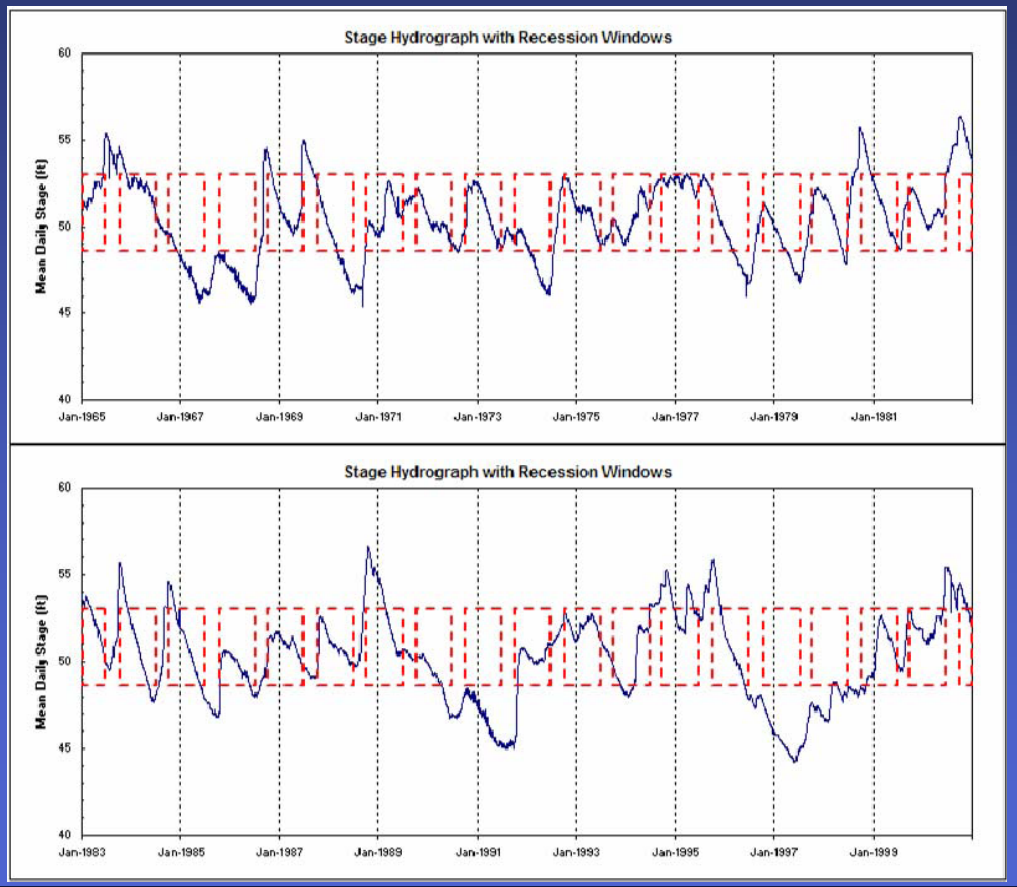
Computer Aided Participation



Computer-Aided Participation Workshop # 3

Project Status

- 9 Alternatives developed
- 100 permutations through screening model
- 3 Computer Aided Participation sessions



Future Updates

- July
  - Initial screening tool results
- September
  - Alternatives advancing to final round
- October
  - 3 Alternatives for promotion to Army Corps

Thank You

Back-pocket slides

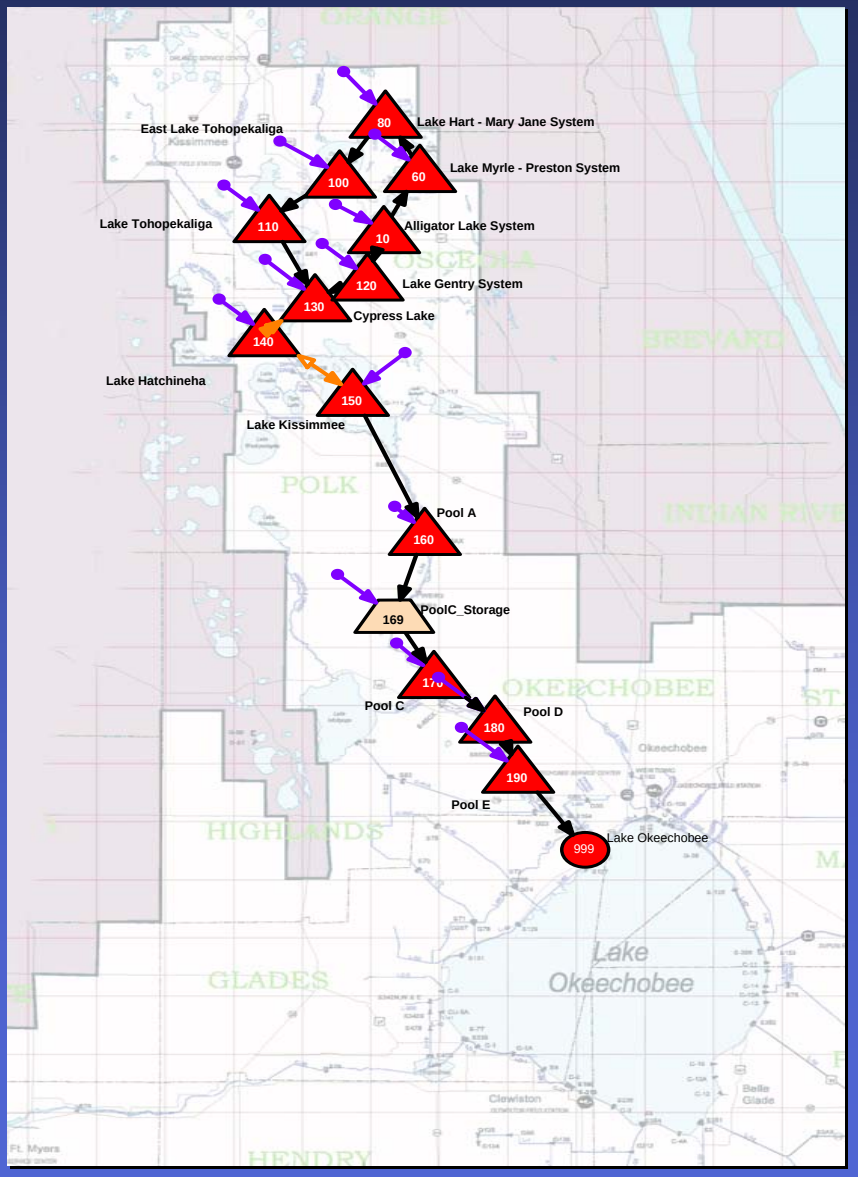
Model Run Times

- Screening Tool (OKISS) – 15 minutes
  - Water budget model
  - Daily Flow, Stage, Storage
- Formulation Tool (MIKE 11) – 2 days (48 hours)

- Evaluation Tool
  - MIKESHE/11 – 1000 ft model 7 days (168 hours)
  - MIKESHE/11 - 3000 ft model 3.8 days (91.2 hours)
- Performance Measure Evaluation Tool – 15 minutes

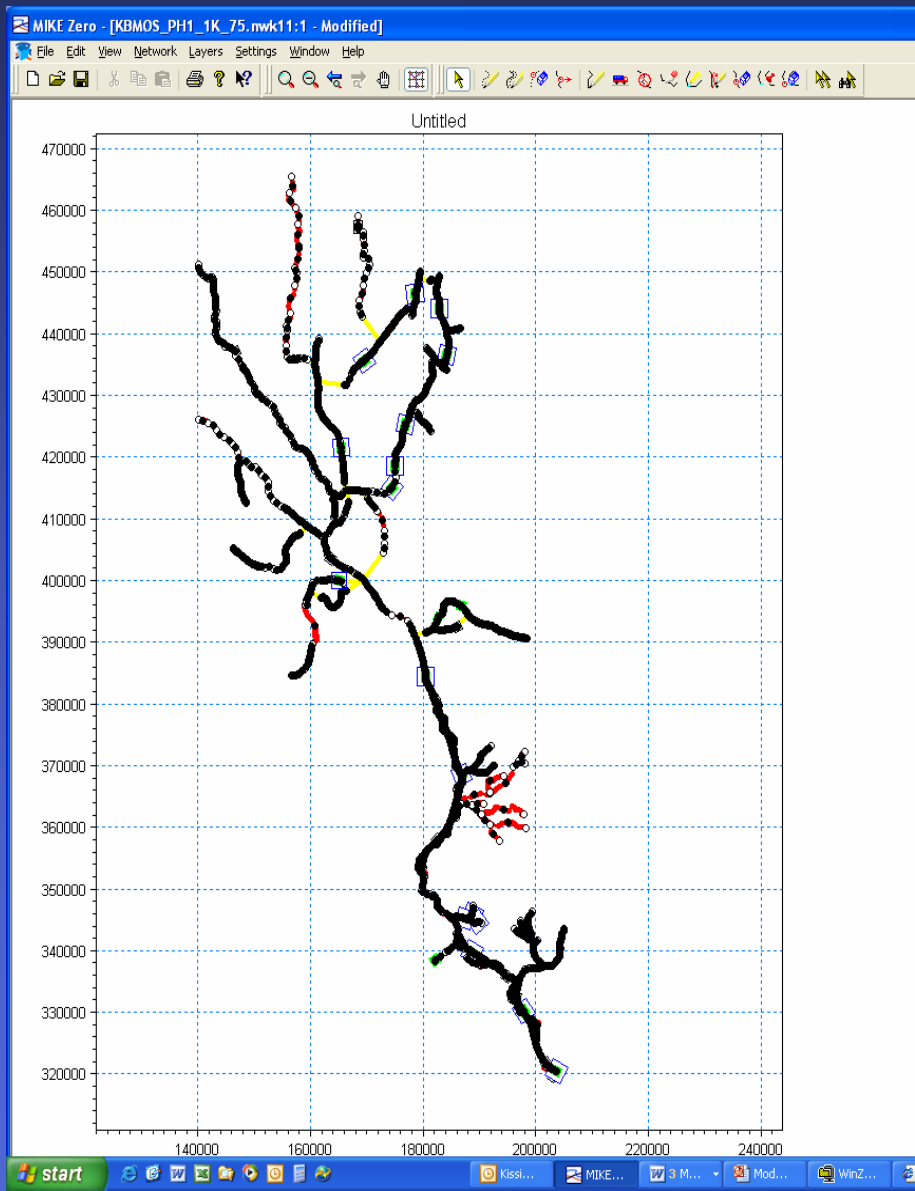
Screening Tool – OKISS

- Screening Tool is a water budget model
- Uses Operations Control Language (OCL) to describe Structure Operations
- Output:
  - Daily Flow – the amount of water moved over time
  - Daily Stage – the elevation of the water surface
  - Daily Storage – volume of water in lakes and floodplain
- Many ways to use flow and stage to evaluate alternative plans



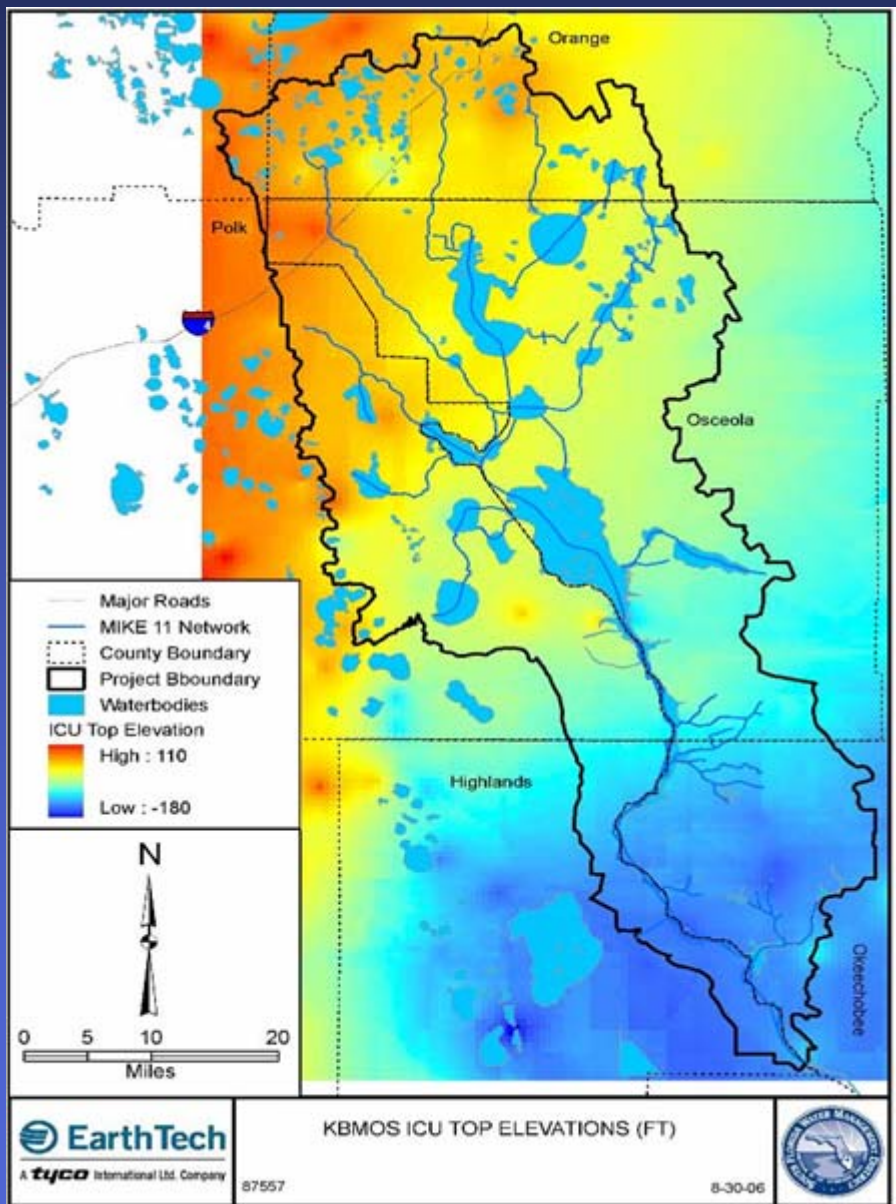
ALTERNATIVE FORMULATION TOOL

- Mike 11 - routing model
- Hydrologic Inflows to be obtained from the Base Condition runs in the fully coupled model (Mike SHE/Mike 11)
- Use full cross sections to represent the extension of the Kissimmee River Floodplain



ALTERNATIVE EVALUATION TOOL

- Fully Couple MIKE SHE/MIKE 11 model
- 3-layer 3,000 ft grid cell including the Floridan Aquifer System (FAS) and the Intermediate Confining Unit (ICU)
- Alternatives will be evaluated with a 1-layer 1,000 ft grid cell model which will use boundary conditions developed with the 3-layer model.



Environmental Impact Statement

- Initiated May 2005
- Scoping letter sent out July 2005
- KBMOS planning process served as basis for USACE EIS scoping
- Scheduled for completion in late 2009

Computer-Aided Participation Sessions

- Provides a forum to develop plan components and evaluate alternative plans with stakeholders
- Screening Model us used to simulate stage and flow that result from alternative plans
- Stakeholders suggest modifications to alternatives, model runs are performed, and results are then provided for discussion and further revision

Alternative Evaluation System

Evaluation Report for Alternative Plan *X*

Performance Indicator Simulation Results (Qualitative)

• **Flood Control**
Plan does not violate the flood control constraint.
Plan shows significant margin between peak flooding of with and without plan and in the S-XX subbasin.

• **Water Supply**
Between X and Y acre-feet of excess water is available with plan in year 16.

• **Aquatic Plant Mgt**
Opportunities for aquatic plant management occurred on Lake Kissimmee in years 9 and 21.

• **Lake Okeechobee**
Discharges made to Lake Okeechobee exceeded the desired volume by 26% during year 16 and 17% in year 29.

(examples of qualitative interpretations)

[more details and graphics as required]

Performance Measure Simulation Results (Quantitative)

• **Natural Resources**

Weighted Composite Scores

EPM#	Score
1	6.3
2	4.4
3	3.6
4	4.5
5	5.1
6	2.5
7	6.7
8	8.2
9	4.9
10	5.5
11	3.4
12	6.8
13	5.2
Total for Plan	67.1

(examples of quantitative interpretations)

[more details and graphics as required]